

SEP 11 1981

EVALUATION FRAMEWORK

AND

PRELIMINARY CRITERIA

HAMILTON-WENTWORTH RAPID TRANSIT PROJECT

Prepared By: M.M. Dillon Limited
For Submission By: Metro Canada Limited
To: The Regional Municipality of
Hamilton-Wentworth

URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO

MCL Report HW-1-3.0
Part of Task 4.8
March 10, 1981

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Hamilton-Wentworth Rapid Transit Project Office
100 Main St.E., Hamilton, Ont. L8N 3W4 · telex 0618561 · (416) 523-8215

March 10, 1981

Mr. M.M. Ross
Project Co-Ordinator
Rapid Transit Project
100 Main Street East
Hamilton, Ontario
L8N 3V9

Dear Mr. Ross:

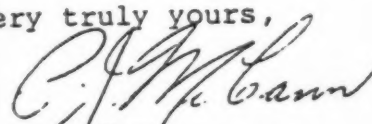
Subject: Report HW-1-3.0:
Evaluation Framework and Preliminary Criteria

We are pleased to submit final report HW-1-3.0, Evaluation Framework and Preliminary Criteria. This report is submitted in accordance with the requirements described in Task 4.8 (Sub-section 4.8 of Schedule A to the UTDC - Region Pre-implementation Program Contract). This report has been prepared under Metro Canada direction by M.M. Dillon Limited, and has previously been reviewed in draft form by the Technical Advisory Committee. We trust that the results of that review are satisfactorily reflected in this final report.

As you are aware, these criteria have been developed on the basis of the Regional and senior government policy goals and objectives that relate to the rapid transit project. The framework, having been reviewed earlier by the Technical Committee, has been applied to the recently completed evaluation of the alignment segments, and is planned to be applied in the evaluation of the remaining four alignments in a few weeks. The framework and criteria described in this report will be an important reference for the Ministry of the Environment review in the event that the Region submits the rapid transit project for approval.

We have enclosed with this letter one bound copy for your use, and one unbound copy suitable for reproduction.

Very truly yours,



P.J. McCann
Project Manager

PJM:jp

Encl.

cc: C.T.C. Armstrong

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1.0 INTRODUCTION

This report is intended to serve two major purposes:

- to provide a general evaluation framework outlining the process by which evaluation criteria should be selected and applied;
- to provide a broad range of possible criteria which could be employed in the evaluation of alternative alignments.

2.0 EVALUATION FRAMEWORK-- --

The function of this section is to describe, in general terms, the process by which evaluation criteria should be selected and applied. As the study proceeds, this process, and the criteria to be employed at each stage, will be further refined.

2.1 Goals and Objectives

The first stage in the evaluation process was the identification of system goals and objectives. The purpose of the system goals and objectives was to provide a basis for the development of methods for generating alternative alignments and to identify major areas of concern. This stage is now completed and is contained in the document entitled "System Goals and Objectives".

2.2 Preliminary Evaluation Criteria

The second stage, represented by this report, is the formulation of a general evaluation framework and a range of possible evaluation criteria. The evaluation criteria represent the next level of detail down from the objectives. They are also somewhat narrower in scope. Unlike the system objectives, which apply to the full range of concerns likely to be encountered during the course of the study, the criteria only address those considerations which might influence comparisons among alignment alternatives.

The preliminary list of criteria has been very broadly defined, consistent with the broad definition of the environment contained in the Environmental Assessment Act. No distinctions have been made, at this point, concerning the level of evaluation at which different criteria might be employed.

2.3 Selection of Criteria for Twelve Way Comparison

Before decisions can be made concerning which criteria will be used in the twelve way comparison, two decisions will need to be made. As the types of concerns which will be addressed in the selection of alignments will vary geographically, it will probably be advantageous to divide the study area into sub-areas. One possibility might be a sub-area for the portion of the study area above the escarpment, a second for the escarpment itself and a third for the portion of the study area below the escarpment.

A second major decision, which will need to be made, concerns how the term "alternative alignment" will be defined. Considerations, which may or may not form part of the initial definition of alignment, could include: horizontal alignment, vertical alignment, transfer point location, connections with surface transit, parking lots, road interfaces and yard locations. The level of detail at which the twelve alignments are defined will largely dictate which criteria are selected.

The identification of appropriate criteria for the twelve way comparative analysis will consist of a process of systematically eliminating criteria which are not applicable, which are only appropriate for the four way comparative analysis and which would clearly not result in the identification of differences among alignments.

Different criteria should be selected for each sub-area. As a large number of alternatives are to be evaluated and as the differences among alternatives will be quite substantial, a relatively small number of criteria should be employed.

In addition to selecting from the initial list of criteria, it is probable that new considerations and areas of emphasis will be identified which will require the formulation of new criteria and the modification of existing criteria.

2.4 Application of Criteria - Twelve Way Comparison

Once the criteria have been selected for each sub-area, the analysis of the alternative alignments can commence. In order to facilitate the subsequent comparative analysis it would be desirable if the differences among the alternatives are recorded on working tables. The criteria could be listed in one column of the table and the performance of each alternative could be recorded in the remaining columns.

Even with a relatively small number of criteria it is probable that there will be too much information on the tables to ensure that the major differences among the alternatives can be readily identified. A variety of methods will, therefore, be employed to facilitate the comparative analysis. These methods will include:

- summarizing the information contained in the tables;
- ranking criteria on the basis of input from the technical committee and the public;
- deleting criteria where differences are negligible;
- combining criteria which measure different aspects of the same concern;
- scaling e.g. converting numbers to ratios or percentages to demonstrate magnitudes of differences;
- establishing thresholds e.g. transit service or capital cost levels below which or above which alternatives would be considered unacceptable.

This process of simplification will facilitate the identification of major differences in terms of the most significant criteria. By progressively eliminating the least acceptable alternatives, it should be possible to reduce the number of alternatives to a more manageable number e.g. three to four alignments.

2.5 Selection of Criteria for Four Way Comparison

Once the number of alignment alternatives has been reduced to three or four, the differences will be much more subtle and much more detailed criteria and analyses will be required. ~~The first step~~ in the process will again be one of defining sub-areas and defining the elements of an alternative alignment.

The evaluation, at the four way comparison stage, should probably consist of two steps. The first step would be the evaluation of options associated with each alignment, concerning such matters as station location, the provision of parking, surface transit, car and pedestrian access. Different project characteristics, evaluation criteria and study areas would be employed in the evaluation of such options. Once the most suitable options have been selected, the characteristics of the four alternative alignments could be defined more precisely. The precise definition of alignment characteristics would, in turn, facilitate the selection of criteria for the four way comparative analysis; the second stage of the evaluation process.

Part of the process of defining alternative alignments for the four way comparison would also include combining the links selected within individual study areas into complete alignments. Thus, complete alignments, rather than study area segments, would be compared in the four way comparative evaluation.

A great many more criteria will be employed, at a finer level of detail, in the four way comparative analysis. The differences among the alternatives, at this stage, will be much more subtle than at the twelve way comparative analysis stage. Thus, much more detailed criteria and analyses will be needed to select a preferred alignment.

2.6 Application of Criteria - Four Way Comparison

After the criteria have been selected, working tables should again be compiled. Separate tables should be prepared for each set of options in addition to the major tables for the four way comparative analysis.

As in the twelve way comparative analysis, the tables will need to be simplified to facilitate decision-making. Methods, such as summarizing and the ranking, combining, deleting and scaling of criteria will again be used to assist in the identification of major trade-offs. Procedures, such as those cited above, will facilitate the selection process, but it is unlikely that a decision can be made on purely technical grounds. The final decision will undoubtedly depend on the relative significance attached by the technical and political representatives and the general public to the major differences among the alternatives.

3.0 EVALUATION CRITERIA

The following tables identify a large number of criteria which could conceivably be used in different stages of the evaluation process. It should be emphasized that these tables are intended only to serve as a general reference source from which criteria might be selected. It is understood that only a small number of criteria will be used at any one stage in the process.

The tables are organized to indicate how the criteria represent an extension of the system goals and objectives. Where system objectives are not pertinent to the alignment selection process, an attempt has been made to identify the components of the study to which they would apply. Comments have also been provided concerning appropriate means of undertaking analysis related to particular criteria.

In addition to the specific comments contained in the tables, the following general comments have been formulated to assist in the application of the criteria:

- the analysis should focus on those considerations which represent major differences among alternatives;
- a consistent level of detail should be maintained;
- the methods of gathering data for each criterion should be specified;
- each level on scales intended to indicate qualitative differences should be defined;

- areas and degrees of uncertainty or risk should be explicitly identified;
- instances where potential impacts can be prevented or significantly reduced through planning controls, design changes and other mitigating measures should be identified;
- care should be taken to ensure that a distinction is drawn between impacts and changes which have occurred as a result of factors other than the ICTS system;
- information sources should be identified.

COMMENTS

POSSIBLE CRITERIA

OBJECTIVES

- 1.a) Demonstrate that the capital costs associated with ICTS are lower than comparable transit technologies.
 - . addressed in rapid transit rationale and alternative modes; also addressed in (Obj. 8b)
- b) Demonstrate the ability to provide safe, reliable, quiet and high frequency transit service.
 - . addressed in rapid transit rationale, alternative modes and operations
 - . also addressed in (Obj. 2a, 2e)
- c) Demonstrate the ability of ICTS to operate effectively as a revenue producing system.
 - . addressed in rapid transit rationale and operations
 - . also addressed in (Obj. 8c)
- d) Demonstrate the relative advantages of an elevated exclusive right-of-way transit system, such as minimal property acquisition requirements and minimal disruption to existing surface traffic.
 - . addressed in rapid transit rationale
 - . also addressed in Obj. 4c) and Obj. 6a, 6b and 6c
- e) Demonstrate the low levels of noise emission of ICTS vehicles, relative to conventional rail vehicles.
 - . addressed in rapid transit rationale
 - . also addressed in Obj. 6b ii)

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
f) Demonstrate the relative advantages of an automated intermediate capacity transit technology.	- addressed in rapid transit rationale - also addressed in Obj. 2a) and 2b)	
g) Demonstrate how ICTS can be effectively and aesthetically integrated into a range of urban and suburban environments.	- addressed in rapid transit rationale - also addressed in Obj. 6b v) and 7d)	
h) Demonstrate the ability of ICTS to operate in a range of climatic and topographic conditions.	addressed in rapid transit rationale and alignment generation	
i) Provide an opportunity to refine and operationally apply the ICTS technology.	addressed in rapid transit rationale	
j) Provide a "showcase" for ICTS to assist in marketing the technology.	addressed in rapid transit rationale	
k) Advance the "state-of-the-art" of Canadian transit technology and, in turn, its position in the world marketplace.	addressed in rapid transit rationale	
l) Provide opportunities for Canadian industry for both domestic and export markets.	addressed in rapid transit rationale	

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
m) Generate employment opportunities in the Region and elsewhere in Canada.	addressed in rapid transit rationale	
2.a) Provide for the efficient movement of the transit public.	- addressed in rapid transit rationale and alternative modes - also reflected in extent of service objectives (Objs. 3.a)-3.j)) and transportation integration objectives (Objs. 4.a)-4.g))	concerns such issues as headway times (peak, off-peak, and weekend service), pedestrian circulation, speed, reliability, capacity
b) Ensure a safe, quiet and comfortable ride.	addressed in rapid transit rationale and alternative modes	concerns such issues as vehicle maintenance, area per passenger, temperature, noise, security, air pollution, vibration, safety
c) Provide a bright and attractive transit environment.	addressed in preliminary and final design	concerns such issues as lighting, colour, building materials and finishes, natural light
d) Provide a broad range and high standard of ancillary facilities and standards.	- generally addressed in alternative modes and preliminary and final design - differences in standard of service provided	- examples - parking, "kiss and ride" - possible, in some instances, that certain station locations might be so confined that lower standards might be required for such services as parking

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
e) Ensure ancillary facilities and services are conveniently located.	- proximity of yards to alignment - proximity of parking to transfer points	with some intermediate transfer points off-street parking may not be needed
f) Take advantage of opportunities to provide riders with attractive views.	qualitative analysis taking into consideration such factors as variety, sequence, uniqueness and orientation	- could be scaled to facilitate comparison - each level in the scale should be defined
3.a) Satisfy future demand during the peak travel periods.	- broad range of possible criteria including: - ridership for horizon year x - yearly ridership/mile - daily ridership for horizon year x - daily ridership/mile - ridership in peak hour in peak direction - P.M. ridership in peak hour in peak direction - ridership at maximum load point on the route - peak period travel time savings (hours/yr) - potential horizon year travel savings (hours/yr) - ridership/corridor demand or population in corridor - ridership/system capacity	- ridership - walk in and transfer - travel time - running time + $\frac{1}{2}$ headway time (could distinguish peak and off-peak, uphill and downhill) - minutes per trip $\times 1/60$ (min/hr) $\times 250$ (weekdays/yr) $\times 2$ (trips/day) $\times$ number of peak hour transit trips - average savings in travel time on system assumes average trip length of x and average speed of y

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
b) Serve a diversity of trip purposes during off-peak and weekend periods.	- number of major activity centres within distance x or walking time y of transfer points - also addressed Obj. 3.e)	- time or distance contours around transfer points on base of major activity centres - could consider adding travel time z on surface transit
c) Provide convenient access for residents living above the mountain to the downtown core of Hamilton.	- travel time between terminal points - population within distance x or walking time y of transfer points - number of downtown employees within distance x or walking time y of transfer points - percentage of downtown employees within distance x or walking time y of transfer points - square feet of office space within distance x or walking time y of transfer points - distance from downtown terminal point to subregional centre - travel time from downtown terminal point to subregional centre	distance or travel time contours over population and employment density maps
d) Improve rapid transit access between the downtown and the subregional centre on Hamilton Mountain.		includes travel time on ICTS and, if applicable, surface transit (including waiting time for latter)

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
e) Provide convenient access to and among other major existing and planned activity centres including major employment and retail concentrations, concentrations of high density residential development and major institutional and recreational facilities and uses.	- number of major existing or committed activity centres within distance x or walking time y of transfer points - number of major planned activity centres within distance x or walking time y of transfer points - population with x minutes, non-peak hour travel time, from selected activity centres - square feet of gross leasable retail floor space within distance x or walking distance y of transfer points - door to door travel time comparisons among selected activity centres - population with distance x of alignment - percentage of corridor residents within distance x of alignment	- examples of major activity centre stadia, major educational facilities, medical and social services centres, theatres, museums, major parks and recreational facilities - criteria primarily directed towards non-peak hour trip generators - in comparing distances a qualification should be added where there are substantial differences in relative ease of street access
f) Provide rapid transit service in high density corridors with a concentration of activities and uses.		

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
	average density people/acre or units/acre) within distance x of alignment	
g) Provide convenient rapid transit service to activity centres within the downtown.	- number of major downtown activity centres within distance x or walking time y of transfer points - number of stations within downtown - door to door travel time comparisons among selected activity centres - downtown route miles	includes both travel time on ICTS system and walking time
h) Provide convenient rapid transit service within the suburban area.	- population with distance x or walking time y of suburban transfer points - number of suburban transfer points - suburban route miles per capita (suburban population) - percentage of suburban population within distance x or walking time y of suburban transfer points	- could also include population within travel time x on surface transit - could also include population within travel time x on surface transit

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
i) Give consideration to the provision of rapid transit service to social and economic groups who are heavily dependent on transit usage.	number of households below income level x within distance x or walking time y and within travel time z on surface transit of transfer points	
j) Give consideration to the potential to serve groups such as the elderly and the handicapped.	- number of units of assisted housing within distance x or walking time y, and within travel time z, on surface transit of transfer points - number of units of housing for the elderly within distance x or walking time y, and travel time z on the surface transit, from transfer points - population, 65+, within distance x or walking time y, and travel time z on the surface transit, from transfer points - proportion of city population, 65 and over, within distance x or walking time y, and travel time z, on the surface transit from transfer points	the elderly also represent a group heavily dependent on transit (Obj. 3 i))

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
	also addressed in station and vehicle design, where physically and financially feasible	Ham. O.P. - suggested measures - ramping of sidewalks, use of ramps and elevators, special parking provisions and co-operation with other public agencies (Ham. O.P. 2.3, page 108)
4.a) Integrate the rapid transit system with inter-regional transit services.	- proximity to the planned multi-mode transportation terminal - qualitative analysis of relative convenience of connections to regional surface transit system	could be scaled to facilitate comparative analysis
b) Integrate the rapid transit system with the existing and planned local surface transit system.	- changes in level and extent of service e.g. - length of bus routes - areas served - relative difference in extent to which complements or duplicates current surface transit service e.g. - changes in travel time - rapid transit vs. buses - changes in modal split - transit vs. auto - changes in headway times	

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

- qualitative analysis of relative consistency with surface transit improvement plans
 - could be scaled to facilitate comparative analysis
 - also reflected in changes in capital and operating costs associated with the surface transit system (Objs. 8. b) and 8. c))
 - change in level of service provided by roadway
 - vehicles/hr/direction or lanes/mile
 - number of local street closings
 - spacing of spans may be such that impairment of cross movements and turning movements at major intersections can be avoided
 - length of diversions of cross streets
 - change in traffic volumes on arterials which cross alignments (as a result of diversions)
 - also reflected in changes in capital and maintenance costs associated with the road system (Objs. 8. i)
 - cost savings reflected in reduced capital costs (Obj. 8. b)) and operating costs (Obj. 8.c)
- c) Minimize the disruptive effects of the rapid transit system on the existing and planned, local and regional road system, having particular regard to maintaining the capacity and safety of the arterial road system.
- d) Take advantage of opportunities for joint use of rights-of-way and transportation facilities, providing existing and planned uses are not impaired.

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

e) Provide convenient and direct bus access to transit transfer points.

- distance from station platforms to bus loading areas
- distances from existing transit routes along local streets (not suitable for surface transit) to transfer points
- population within x minutes travel time by feeder bus to transfer points

f) Integrate the rapid transit system with existing and planned public parking facilities.

- number of existing public and private off-street parking spaces within distance x or walking time y of transfer points
- number of committed and planned off-street parking spaces within distance x or walking time y of transfer points

g) Provide safe, convenient and direct pedestrian access to rapid transit transfer points.

- population within distance x or walking time y of transfer points
- directions from which direct pedestrian access to transfer points possible
- also addressed in preliminary and final design
- safety indices identified in Hamilton O.P. e.g. illumination standards, use of light coloured building materials and finishes, glass doors and low traffic areas close to general activity areas (Ham. O.P. C. 22, page 107)

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

. could be scaled to facilitate comparative analysis

. qualitative analysis of relative safety in immediate proximity of transfer points; analysis would include such considerations as potential for car-pedestrian or bus-pedestrian conflict, provision for pedestrian crossings, and sight-lines at points of access

. also addressed in Obj. 6. c) v)

. number of trails severed

. length of trail reroutings

. also addressed in Obj. 6. c) vi)

. the environmental analysis of the Escarpment area could serve as a basis for identifying degrees of disturbance; the alignments could then be rated on the basis of the extent to which they crossed the Escarpment at locations already heavily disturbed by human activity e.g. existing road alignments

. the environmental analysis of the Escarpment area could serve as a basis for identifying the most significant geological features in the area; the alignments could then be rated on the degree of impact which they have on such features

5.a) i) Maintain public access to and along the Escarpment by means of walking and hiking trails.

ii) Maintain the least disturbed Escarpment slopes and Escarpment-related stream valleys.

iii) Maintain the most significant geological formations of the Escarpment.

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
iv) Maintain the most significant cultural, historic and archaeological sites and uses associated with the Escarpment.	- number of buildings and sites of historical, archaeological or cultural significance wholly or partially displaced or made inaccessible - impacts on historical and cultural buildings and sites also addressed in Obj. 6. a) vii)	analysis would include a qualitative assessment of the character and significance of affected resources and facilities
v) Maintain major recreation and conservation activities in areas associated with the Escarpment.	- distance through recreation and conservation areas - acres of public open space displaced - qualitative analysis of degree of disturbance to individual recreational activities within such areas	could be scaled to facilitate comparative analysis
vi) Ensure that the design of the rapid transit system is compatible with the form and character of the Niagara Escarpment.	- also addressed in Obj. 6. a) iv) - qualitative analysis of relative ease with which the facility can be integrated with the Escarpment - primarily addressed in preliminary and final design - would include consideration of such factors as scale, materials, form, colour, etc. - methodology comparable to integrating facility with existing streetscape (Obj. 6. b) v))	could be scaled to facilitate comparative analysis

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
vii) Minimize obstruction of views to and from the Escarpment.	- qualitative analysis of degree to which views obstructed along major visual corridors - methodology comparable to analysis of obstruction to view of landmarks (Obj. 6.b) vii))	- analysis would involve site visits and photographic analysis of sight-lines - could be scaled to facilitate comparative analysis
viii) Minimize potential construction problems because of soil instability	qualitative analysis of differences in potential for disturbance to soil stability of escarpment	could be scaled to facilitate comparative analysis
b) Minimize adverse impacts on other unique land features and environmentally sensitive features.	- distance through sensitive areas - distance abutting sensitive areas - acres of wooded areas (by type), displaced	- environmental analysis of features comparable to that described under Obj. 5.a) ii) would enable scaling of relative significance of resources displaced or otherwise affected - analysis would include such considerations as extent, diversity, uniqueness and continuity of vegetation, species diversity and uniqueness, continuity and productivity of habitats
c) Minimize removal of mature trees.	number of mature trees, by type and significance, displaced	- Regional O.P. defines woodlot as 1.0 hectares (2.5 acres) (Reg. O.P. 15.2.6, page 106) - analysis of significance would include such considerations as age, height and species type

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
d) Minimize the potential for erosion and surface and ground water pollution.	- primarily considered in preliminary and final design - environmental analysis may identify areas especially susceptible to erosion and slumping, where such effects would be very difficult and expensive to overcome during construction - the differences in potential for such problems could be mapped and scaled and employed in the comparative analysis of alignments - partially considered in capital costs (Obj. 8. b))	measures cited in Hamilton Official Plan - daily removal of debris resodding, paving or other measures to stabilize exposed slopes (Ham. O.P. C. 4.6, page 110)
6.a) i) Minimize displacement of people, jobs and buildings.	- number of persons displaced - number of dwelling units displaced or made inaccessible - number of jobs displaced - number of businesses, wholly or partially, displaced or made inaccessible	
ii) Give consideration to social and economic groups, such as the elderly and people on low incomes, who are most sensitive to change.	- number of senior citizens and people on low income displaced by the facility - also addressed during final design and construction	

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

iii) Attempt to ensure that people who are displaced are able to find comparable shelter at comparable cost and preferably within the community.

- addressed during final design and construction

iv) Give special consideration to minimizing the loss or reduction in area of public facilities, amenities and resources.

- distance through public open space
- acres of public open space displaced
- qualitative analysis of degree of disturbance to individual recreational activities within public open space areas displaced

- distinction - open space by type and whether change results in a deficiency of open space of a particular type as defined by municipal standards

- could be scaled to facilitate comparative analysis

- acres of other public lands displaced

- number and type of public facility wholly or partially displaced or made inaccessible

- qualitative analysis of significance of facilities displaced and whether results in a deficiency as defined by municipal standards

- displacement of recreational and conservation uses also addressed in Obj. 5. a) v)

- replacement costs for public open space and facilities addressed in capital costs (Obj. 8. b))

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
v) Minimize the displacement, reduction in area or severance of existing private uses.	- distance through private land - acres of private land displaced - acres of designated residential land displaced or made inaccessible - acres of commercial and industrial land displaced or made inaccessible	analysis would include assessment of significance of the private activities and lands displaced
vi) Give special consideration to sites and facilities of historical, cultural and archaeological significance.	- number of buildings and sites of historical, archaeological or cultural significance wholly or partially displaced or made inaccessible - impacts on historical, archaeological and cultural resources also addressed in Obj. 5. a) iv)	analysis would include a qualitative assessment of the character and significance of affected resources and facilities
vii) Ensure that adverse effects associated with relocation are minimized.	addressed during final design and construction	
b) i) Minimize noise, vibration and air pollution levels and related effects on the enjoyment and use of private property and facilities.	<u>Vibration</u> - number of existing dwelling units within distance x exposed to vibration levels above standard y - number of existing dwelling units within distance x exposed to any increase in average vibration levels	could include gross and net figures i.e. before and after mitigation

OBJECTIVES

POSSIBLE CRITERIA

Noise

- number of residential lots exposed to noise increases during transit operations which would exceed acceptable standards
- number of existing residential lots which would be exposed to any increase in average noise levels due to rapid transit operations
- number of dwellings likely to be exposed to noise disturbance during construction
- also addressed during final design (noise attenuation), construction (construction procedures) and operations (operating procedures, monitoring and notification of future residents)

Air Pollution

- addressed in rapid transit rationale and alternative modes
- distance through public open space
- distance through residential areas
- distance abutting public open space
- distance abutting residential areas

ii) Give special consideration to uses and activities especially sensitive to noise and vibration.

COMMENTS

- possible for different standards for different periods e.g. peak, off-peak, evening and different land uses e.g. residential, open space industrial
- residential development only permitted where attenuated noise levels in outdoor recreation space do not exceed 70 dBA
- warning to future residents (in title or in lease or rental agreement) if greater than 55 dBA (Ham. O.P: 7.16, page 119)
- could include gross and net figures i.e. before and after mitigation

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
	number of other sensitive uses e.g. hospitals, nursing homes, within distance x of alignment and distance y of transfer points and subject to an increase in existing noise levels during construction or operations	could include gross and net figure i.e. before and after mitigation
iii) Minimize loss of privacy	- distance through residential areas - distance abutting (on one side) residential areas - number of residential properties, ground oriented and up to x floor level within distance y and visible from vehicles and stations	could involve site visits and photographic analysis including consideration of angle of over-look, distance from track and speed of trains
iv) Minimize visual intrusion as a result of the appearance of the transit facility, lighting, differences in scale and overshadowing.	- number of dwelling units subject to overshadowing - number of floors of office buildings subject to overshadowing - qualitative analysis of relative severity of intrusion as a result of scale differences, lighting, etc.	- could include gross and net figures i.e. before and after mitigation - analysis would be limited to non-mitigatable impacts as mitigation addressed in Obj. 6. b) v) - could be scaled to facilitate comparison

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
v) Maximize opportunities for visual integration with the existing streetscape	- qualitative analysis of relative ease with which facility can be integrated with streetscape - major consideration in preliminary and detailed design	could be scaled to facilitate comparison
vi) Minimize the creation of visual barriers.	- number of dwelling units from which views are blocked - may be possible to combine this analysis with that for Obj. 6. b) iii) and 6. b) vii)	- field analysis of existing sightlines - use of maps and photographs for geometric analysis i.e. fractions of views obstructed
vii) Minimize the obstruction of views to symbolically important public and private landmarks.	- qualitative analysis of degree to which views obstructed along major visual corridors - methodology comparable to analysis of obstruction of views to Escarpment (Obj. 5. a) vi))	- analysis would involve site visits and photographic analysis of sightlines - could be scaled to facilitate comparative analysis
viii) Minimize the intrusion of through traffic, both private vehicle and feeder bus, onto local streets.	- percentage change in traffic on parallel streets - distance along local streets which would be used by feeder buses and cars travelling to or from transfer points - qualitative analysis of severity and duration of congestion likely on local streets	could be scaled to facilitate comparison

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

ix) Minimize the use of local streets for transit associated parking.

- generally addressed in design criteria for off-street parking and in operations (parking prohibitions and enforcement procedures)

- qualitative analysis possible in terms of differences among neighbourhoods and local commercial streets concerning severity of on-street parking problems - could be scaled on basis of likelihood of compounding an existing problem

- could also be a positive factor in the sense of alleviating an existing shortage of off-street parking

c) i) Minimize restrictions to pedestrian and vehicular access to buildings and property.

- number of pedestrian and vehicle access points to buildings and property removed
- number of pedestrian and vehicle access points to buildings made less direct

ii) Minimize restrictions to access to community facilities, services and amenities.

- impacts primarily limited to portions of alignment at grade or open cut

- number of elementary school catchment areas severed

- number of other community facility catchment or service areas severed e.g. local parks, libraries, community centres, local stores

- number of primary access routes to community facilities and parks made more indirect or otherwise disrupted

OBJECTIVES

POSSIBLE CRITERIA

- change in number of neighbourhood residents within distance x or walking time y of neighbourhood facilities, activities and features
 - changes in private vehicle travel time among selected local origins and destinations
 - also addressed in Obj. 6. c) xi)
- iii) Minimize restrictions to the provision and delivery of community services, with particular consideration to ensuring the maintenance of existing levels of service by emergency vehicles.
 - number of emergency facility catchment areas severed
 - change in number of people within x minutes driving time of emergency facilities e.g. police stations, fire stations, hospitals
- iv) Minimize restriction to existing patterns of social interaction.
 - number of pedestrian paths severed
 - number of pedestrian paths made more indirect
 - length of additional path length provided along the right-of-way

COMMENTS

- travel time or distance contours around facilities superimposed over estimated population or existing land use (number of dwellings)
- impacts primarily limited to portions of alignment at grade or open cut
- travel time or distance contours superimposed over catchment areas and estimated population
- impacts primarily limited to portions of alignment at grade or open cut
- analysis would necessitate assessment of physical evidence i.e. desire lines and interviews with residents
- with a linear facility there may be opportunities for pedestrian paths along the right-of-way

COMMENTS

POSSIBLE CRITERIA

OBJECTIVES

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| <p>b) Conform, where possible, with all Government policies and priorities.</p> <p>c) Co-operate with adjacent municipalities and other agencies and levels of government.</p> <p>d) Involve elected representatives at critical decision points in the planning process.</p> <p>e) Provide residents, land owners, special interest groups and other members of the general public the opportunity to participate in the planning process at critical decision points.</p> <p>f) Make available to the general public information concerning the progress of the study.</p> | <ul style="list-style-type: none"> . Regional and City policies built into objectives and criteria . also addressed through co-ordination with other agencies (Obj. 10. c)) . general project management responsibility . addressed by public participation team . addressed by public participation team . addressed by public participation team |
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OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
v) Segregate pedestrian and vehicular traffic where potential conflict exists.	. primarily a design consideration . number of instances where pedestrian cross movements are diverted in a manner which results in more hazardous crossings . qualitative analysis of relative safety in immediate proximity of transfer points; analysis would include such considerations as car-pedestrian or bus-pedestrian conflict, provision for pedestrian crossing, sidewalks and sightlines at point of access . also addressed in Obj. 4. g)	. impacts primarily limited to portions of alignment at grade or open cut
vi) Minimize the severance of walking and bicycle trails.	. number of walking or bicycle trails severed . number of walking or bicycle trails made more indirect . length of additional trails provided along the right-of-way . also addressed in Obj. 5.a) i) and 5. c) iv)	

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
vii) Minimize disruption of functionally-related uses.	number of functionally-related uses where necessary interactions are seriously impacted	would necessitate interviews with municipal staff and building owners to determine nature of interactions and relative severity of impacts
viii) Take advantage of opportunities to separate incompatible uses.	number of major incompatible uses separated	would necessitate physical analysis and interviews with municipal staff to determine basis for incompatibility
ix) Minimize the severance of communities and neighbourhoods.	- number of communities severed - distance through residential areas - distance abutting residential areas	- impacts primarily limited to portions of alignment at grade or open cut - community definition considerations e.g. political subareas, secondary planning areas, community association areas, school districts, natural and man-made barriers
x) Take advantage of opportunities to reinforce community boundaries.	number of communities for which boundaries are reinforced	
xi) Give special consideration to the movement of children, as in the access to elementary schools.	- number of elementary school catchment areas severed - number of instances where primary access routes to elementary schools made more indirect or otherwise disrupted	

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

- change in number of students within distance x or walking time y or bus travel time z from school, by type of school

- number of student having to switch schools or school busing status

- also addressed in Obj. 6. c) ii)

- addressed in preliminary and final design

xii) Minimize access to the right-of-way having particular regard to children.

7.a) Ensure consistency with the regional form and local land use patterns.

- qualitative analysis of relative extent to which conforms to Regional and Hamilton Official Plan designations

- could be scaled to facilitate comparative analysis

- issue of conformity with Provincial and Municipal policies built into objectives (See Section 3 of this report)

- consistency with build form addressed in Objs. 6. b) iv) and 6. b) v)

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
b) Locate the transfer points, where possible, adjacent to areas suitable for concentrations of high density residential development, retail and office space and other activities likely to generate a high volume of transit users.	- proximity of downtown transfer points to parks within downtown planned for intensive development or redevelopment - number of major proposed or possible activity centres within distance x or walking time y of transfer points - proposed gross leasable retail floor space within distance x or walking time y of transfer points - estimated potential gross leasable retail floor space (rough orders of magnitude) within distance x or travel time y of transfer points - proposed number of employees within distance x or walking time y of transfer points - possible number of employees (rough orders of magnitude) within distance x or walking time y of transfer points - proposed number of housing units within distance x or walking time y of transfer points - possible number of housing units within distance x or walking time y of transfer points	these criteria address proposed or possible uses and the criteria in (Obj. 3. e) address existing, committed and planned uses - few such areas have been predestinated although the policies of the Regional and City Official Plans favour more intensive uses in close proximity to transit transfer points

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

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|---|--|--|
| <p>c) Locate transfer points where possible in locations where development land is available and where more intensive development is compatible with the character of the area.</p> | <ul style="list-style-type: none"> • acres of vacant land suitable for development within distance x or walking time y of transfer points • acres of low intensity uses e.g. parking areas of shopping centres which can be developed more intensively without conflicting with existing uses • qualitative analysis of relative potential for development or redevelopment in close proximity to transfer points | <ul style="list-style-type: none"> • would necessitate interviews with municipal officials and private landowners • development suitability considerations would include such factors as: parcel size, ownership patterns, existing uses, availability of services, and intentions of owners • could be scaled to facilitate comparative analysis |
| <p>d) Provide for the functional and visual integration of rapid transit facility with proposed and possible uses</p> | <ul style="list-style-type: none"> • largely a preliminary design matter e.g. joint design with adjacent owners and design sufficiently flexible to connect to possible future uses • qualitative analysis of relative ease with which facility can be integrated with proposed or possible adjoining uses | <ul style="list-style-type: none"> • could be scaled to facilitate comparative analysis |
| <p>e) Provide for pedestrian and vehicular connections between the rapid transit facility and planned and proposed adjoining uses.</p> | <ul style="list-style-type: none"> • distance between transfer point-entry points and entry points of major planned and proposed uses • qualitative analysis of relative ease of access between transfer points and proposed and planned uses | <ul style="list-style-type: none"> • analysis would include such factors as: potential for direct in-door connection, barriers to pedestrian movement, barriers to vehicular movement |

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

8.a) Minimize property acquisition costs.

- . acres of public land required by level of government
- . acres of private land required
- . property acquisition costs included under capital costs (Obj. 8. b))
- . design consideration in the sense of maximizing use of available land
- . issue of joint use of land and facilities addressed in Obj. 4. d)

. costs include those associated with relocation and replacement and cost savings through joint use of land

b) Minimize capital costs, with particular consideration of physical constraints and associated cost implications.

- . total capital costs
- . net present value of capital costs (capital - salvage = net)
- . capital costs by level of government
- . capital costs minus road and surface transit improvement costs deferred or no longer required

. examples - land, structures, stations, yards, road improvements, upgrading of bus system, track, vehicles, landscaping, signals and communication, electrification, engineering, administration, management and contingencies

. might distinguish at-grade, on-street, off-street, elevated bridge, open cut, underground

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

- annual capital costs (1980 dollars at x per cent interest)
- capital costs per mile

- special considerations - differences in gradient, problems with soils, geology, etc.

- intermodal comparison should include analysis of capital costs associated with satisfying transit demand with conventional bus system

- c) Minimize operations costs having particular regard to ensuring an acceptable proportion of the costs will be borne by the general taxpayer.

Costs

- estimated annual operating cost for horizon year x (1980 dollars)
- annual operating cost minus savings in bus and road maintenance costs
- operating costs by level of government

- total operating and maintenance costs including feeder and trunk service e.g. labour, maintenance, energy, depreciation, claims and insurance, overhead and administration

- intermodal comparison should include reference to operating cost of satisfying transit demand with conventional bus system

$$\frac{\text{Revenue}}{\text{annual revenues}}$$

- annual revenue to operating cost ratio

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
	<u>Subsidy</u>	
	. annual operating deficit	
	. deficit per capita	
	. deficit per passenger mile	
	. operating subsidy (horizon year x)	
	. operating subsidy per passenger	
	. net change in government fiscal flow	. revenues less operating expenditures and annualized capital expenditures
	. ratio of costs borne by fares to property taxes	
	. average annual tax change	
	<u>Cost Performance</u>	
	. operating costs/passenger	
	. total costs/passenger	
	. operating costs/passenger mile	
	. operating costs/revenues/vehicle mile	
	. total costs/vehicle hour	
	. travel time savings/cost (hrs/dollar)	
	. costs/vehicle mile	

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
d) Minimize the potential for property value depreciation.	- direction of change (positive or negative) - partly an indirect consequence reflected in effectiveness of alignment selection and measures to mitigate adverse impacts - public information and careful planning during implementation also important to dispelling myths and avoiding uncertainty	such a complex issue - may not be possible to do much more than predict the direction of change
e) Minimize loss of assessment	- amount of property tax revenue lost - loss in assessment as percentage of total revenue from local services - qualitative analysis of the extent to which losses might be offset by enhanced development potential	
f) Minimize disruption of businesses.	- access to downtown businesses addressed in Obj. 3.c) and 3.g) and 7.b, 7.c and 7.d - displacement of businesses addressed in Obj. 6. a) i) - reduction in area or severance of business addressed in Obj. 6. a) v) - building access addressed in Obj. 6. c) i) - disruption to related businesses addressed in Obj. 6. c) viii) - employment addressed in Obj. 1. m)	

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
g) Maximize the potential for "value capture": that is public financial benefits resulting from redevelopment associated with the transit facility	- qualitative analysis of relative severity of effects and potential for mitigation - qualitative analysis based on such considerations as amount of vacant land, planning requirements, service availability and market conditions	- could be scaled to facilitate comparative analyses - almost impossible to predict dollar differences in business volume - could be scaled to facilitate comparative analysis
h) Minimize the potential for conditions such as special approvals and problems with property availability, which could lead to implementation difficulties and schedule delays	qualitative analysis taking into account such factors as railway relocation hearings, expropriation procedures, service relocation problems, and conflicts with existing, planned or proposed uses	could be scaled to facilitate comparative analysis
i) Minimize the potential for increasing the costs associated with providing other public services or operating other public facilities	- addressed in capital costs (Obj. 8. b)) e.g. road and surface transit improvement costs, replacement cost for public facilities - also addressed during implementation i.e. need for close co-ordination (Obj. 10. c))	

OBJECTIVES

POSSIBLE CRITERIA

COMMENTS

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| j) Ensure consistency with investment program of other public agencies. | <ul style="list-style-type: none"> qualitative analysis of relative differences in consistency with financial plans of other public agencies also addressed in terms of need for co-ordination (Obj. 10. c)) | <ul style="list-style-type: none"> could be scaled to facilitate comparative analysis |
| k) Co-ordinate public investment decision-making for the rapid transit system with private investment decision-making in development and redevelopment associated with the transit system. | <ul style="list-style-type: none"> partly addressed in Objs. 7. b), 7. c), 7. d) and 7. e) qualitative analysis of relative consistency with patterns of demand for new office and retail space | <ul style="list-style-type: none"> could be scaled to facilitate comparative analysis |
| 1) Maximize energy conservation throughout the transit system. | <ul style="list-style-type: none"> addressed in rapid transit rationale, intermodal comparison and operations | <ul style="list-style-type: none"> could be scaled to facilitate comparative analysis |
| 9.a) Ensure flexibility in construction staging to respond to changing circumstances. | <ul style="list-style-type: none"> qualitative analysis of relative differences in potential for incremental implementation | <ul style="list-style-type: none"> could be scaled to facilitate comparative analysis |
| b) Provide for the upgrading and expansion of the system in accordance with transit demand. | <ul style="list-style-type: none"> qualitative analysis of relative differences in potential for expanding system e.g. route extensions, station expansion | <ul style="list-style-type: none"> could be scaled to facilitate comparative analysis |
| c) Ensure flexibility of system geometrics to adapt to existing city site geometric constraints. | <ul style="list-style-type: none"> reflected in capital costs (Obj. 8. b)) addressed in preliminary and final design | |

OBJECTIVES	POSSIBLE CRITERIA	COMMENTS
d) Ensure flexibility to adapt to future technological advances in the ICT system.	• addressed in preliminary and final design	
e) Ensure flexibility to respond to changes in public transportation priorities and programs.	• qualitative analysis of relative differences in dependence upon planned and proposed rather than existing and committed transportation facilities • also reflected in preliminary and final design	• could be scaled to facilitate comparative analysis
f) Ensure flexibility to respond to changes in future land use patterns.	• qualitative analysis of relative differences in dependence upon planned and proposed rather than existing or committed land uses • also reflected in preliminary and final design	• could be scaled to facilitate comparative analysis
10.a) Ensure that all Government approval requirements are satisfied with particular regard to satisfying the requirements of the Ontario Environmental Assessment Act.	• addressed through project management	